

CLAIMS

1. Combined cooling plant/heat pump for use in motor vehicles for cooling, heating and dehumidification of the vehicle interior by means of a ventilation system comprising a refrigerant circuit of the cooling plant/heat pump thermally coupled to the ventilation system over an internal heat exchanger system and said internal heat exchanger system having a first functional unit and a second functional unit, said first and second functional units adapted to be alternately operated as condenser/gas cooler of the heat pump in heating operation, and as evaporator of the cooling plant in cooling operation, and further adapted that in combined dehumidification-reheating operation one of said first and second functional units is operable as an evaporator and the other as a condenser/gas cooler.
2. Combined cooling plant/heat pump of claim 1 wherein the internal heat exchanger system in the refrigerant circuit with said two functional units is structurally designed as a heat exchanger.
3. Combined cooling plant/heat pump of claim 1 wherein said first and second functional units are integrated into the cooling plant/heat pump circuit over a 3/2-multi-way valve and a 4/2-multi-way valve.
4. Combined cooling plant/heat pump of claim 1 wherein said first and second functional units are connected to each other by a two-way expansion element having a bypass, and a second two-way expansion valve having a bypass being provided in the refrigerant circuit.
5. Combined cooling plant/heat pump of any of the claim 1 wherein as heat source for the heat pump operation a coupling heat exchanger is provided thermally coupled to the refrigerant circuit of the cooling plant/heat pump and a coolant circuit of the engine cooling system, whereby heat is transferred from the coolant circuit of the engine cooling system to the refrigerant circuit of the cooling plant/heat pump.

6. Combined cooling plant/heat pump of any of the claim 1 wherein an air heat exchanger is provided as heat source for the heat pump operation, in heat pump operation said air heat exchanger transferring heat from the air to the refrigerant circuit of the cooling plant/heat pump.

7. Combined cooling plant/heat pump of claims 1 wherein in internal heat exchanger system a heating exchanger of the engine cooling system is additionally provided in the ventilation system.

8. A method of operating a combined cooling plant/heat pump comprising the steps of directing in a combined dehumidification-reheating operation refrigerant mass flow over one of first and second functional units to release heat for reheating and subsequently, after decompression, directing refrigerant over the other of said first and second functional units to dehumidify the air.

9. A method of operating a combined cooling plant/heat pump comprising the steps of dividing, in combined dehumidification-reheating operation, refrigerant mass flow downstream of a compressor into partial flows, directing one partial flow for the reheating at a first functional unit and directing another partial flow for the dehumidification at a second functional unit.

10. A combined cooling plant/heat pump for use in motor vehicles to cool, heat and dehumidify the vehicle interior, said combined cooling plant/heat pump comprising:

a ventilation system adapted to provide air to the vehicle interior;

a refrigeration circuit including a heat exchanger having a first functional unit and a second functional unit located within the ventilation system, both of said first and second functional units being a condenser during heat pump operation of said combined cooling plant/heat pump, both of said first and second functional units being an evaporator during cooling plant operation of said combined cooling plant/heat pump, and one of said first and second functional units being an

evaporator and the other of the first and second functional units being a condenser during combined dehumidification-reheating operation of said combined cooling plant/heat pump.